

WHAT IS CLAIMED IS:

- 1 1. An assembly, comprising:
2 a dilator including a hollow distal portion;
3 a sleeve movable within the hollow distal portion of the dilator
4 and formed from a sleeve material having a first hardness; and
5 a needle movable within the sleeve and having a tip formed from
6 a tip material having a second hardness no greater than the first hardness.
- 1 2. The assembly of claim 1 wherein the needle is a transseptal
2 needle.
- 1 3. The assembly of claim 2 wherein the needle is formed from thin
2 walled tubing.
- 1 4. The assembly of claim 1 wherein the distal portion of the dilator
2 has an outer tapered surface.
- 1 5. The assembly of claim 1 wherein the distal portion of the dilator
2 has an outer end surface that is rounded.
- 1 6. The assembly of claim 1 wherein the dilator is formed from
2 plastic.
- 1 7. The assembly of claim 1 wherein at least some of the distal
2 portion of the dilator is curved.
- 1 8. The assembly of claim 1 wherein the first hardness is greater
2 than the second hardness.
- 1 9. The assembly of claim 1 wherein the sleeve material and the
2 needle tip material are the same.
- 1 10. The assembly of claim 1 wherein the sleeve includes a distal
2 portion with a converging surface.

1 11. The assembly of claim 1 wherein the sleeve includes a tapered
2 distal portion.

1 12. The assembly of claim 1 wherein the sleeve includes a rounded
2 distal portion.

1 13. The assembly of claim 1 wherein the sleeve comprises at least
2 two portions.

1 14. The assembly of claim 13 wherein at least one of the at least
2 two portions is a metal distal portion.

1 15. The assembly of claim 14 wherein the metal distal portion
2 includes a converging surface.

1 16. The assembly of claim 14 wherein the metal distal portion
2 extends around a portion of the needle.

1 17. The assembly of claim 14 wherein the metal distal portion of the
2 sleeve includes a converging surface and the distal portion of the dilator has
3 an internal surface that is complementary to the converging surface of the
4 metal distal portion.

1 18. The assembly of claim 14 wherein the distal portion of the dilator
2 has a curved portion and a portion of the metal distal portion of the sleeve is
3 curved.

1 19. The assembly of claim 14 wherein at least one of the at least
2 two portions is a plastic portion.

1 20. The assembly of claim 1 wherein the needle includes a proximal
2 portion adjacent to the tip.

1 21. The assembly of claim 20 further comprising:
2 a bias element positioned and configured to bias the needle

3 toward the distal portion of the sleeve.

1 22. The assembly of claim 21 wherein the bias element includes a
2 spring.

1 23. The assembly of claim 21 further comprising:
2 a hold surface adapted to hold the needle in a first position.

1 24. The assembly of claim 1 wherein the sleeve and the needle
2 include respective proximal portions each with at least one surface
3 complementary to the surface on the other.

1 25. The assembly of claim 24 wherein complementary surfaces
2 provide an interference fit.

1 26. The assembly of claim 24 wherein the complementary surfaces
2 engage each other.

1 27. The assembly of claim 1 further comprising:
2 an introducer sheath configured to receive the dilator.

1 28. An assembly comprising:
2 a dilator including a distal portion with first and second
3 segments, the first segment having a first hardness; and
4 a needle, movable within the dilator, including a tip having a
5 second hardness no greater than the first hardness.

1 29. The assembly of claim 28 wherein the dilator is a transseptal
2 dilator.

1 30. The assembly of claim 28 wherein the dilator defines a central
2 axis and the first segment is closer to the central axis than the second
3 segment.

1 31. The assembly of claim 30 wherein the first segment comprises a

2 layer internal to the second segment.

1 32. The assembly of claim 30 wherein the first and second
2 segments are concentric cylindrical segments.

1 33. The assembly of claim 28 wherein at least some of the distal
2 portion of the dilator is curved.

1 34. The assembly of claim 33 wherein the curved portion of the
2 dilator defines a proximal end and wherein a portion of the first segment is
3 coextensive with proximal end of the curved portion of the dilator.

1 35. The assembly of claim 33 wherein the curved portion of the
2 dilator and the first segment define respective proximal ends and the proximal
3 end of the first segment is proximal of the proximal end of the curved portion
4 of the dilator.

1 36 The assembly of claim 28 wherein the first and second
2 segments extend longitudinally, the dilator defines a length, and the first
3 segment extends substantially the length of the dilator.

1 37. The assembly of claim 28 wherein the first segment comprises a
2 metal first segment.

1 38. The assembly of claim 28 wherein first segment comprises a
2 plastic first segment.

1 39. The assembly of claim 28 wherein first hardness is harder than
2 the second hardness.

1 40. The assembly of claim 28 wherein the first and second
2 segments are concentric, the second segment is outside the first segment,
3 and the second segment comprises a plastic second segment.

1 41. The assembly of claim 40 wherein the second segment is softer

2 than the first segment.

1 42. The assembly of claim 28 wherein the dilator includes a distal
2 portion having a converging surface.

1 43. The assembly of claim 42 wherein the needle includes a surface
2 complementary to the converging surface of the dilator for contacting the
3 convergence surface of the dilator.

1 44. The assembly of claim 42 wherein distal portion of the dilator
2 includes first and second internal surfaces and the second internal surface is
3 closer to the needle than the first internal surface.

1 45. The assembly of claim 28 wherein the needle is formed from
2 hypotube.

1 46. The assembly of claim 28 further comprising:
2 an introducer sheath configured to receive the dilator.

1 47. An assembly, comprising:
2 a dilator tube having a proximal portion and a distal portion, the
3 distal portion including a converging surface and a distal end opening;
4 a transport tube having a proximal portion, a distal portion and a
5 distal end, the transport distal end defining a transport distal end opening, the
6 transport tube being located within the dilator tube and configured such that
7 the distal portion of the transport tube may be positioned adjacent to the distal
8 portion of the dilator tube; and
9 a needle within the transport tube and movable relative to the
10 transport tube.

1 48. The assembly of claim 47 wherein the dilator tube defines a first
2 transverse cross-sectional area proximal to the distal end opening of the
3 dilator tube and the distal end opening of the dilator tube defines a second
4 cross-sectional area less than the first cross-sectional area.

1 49. The assembly of claim 48 wherein the distal portion of the
2 transport tube defines an outer transverse cross-sectional area greater than
3 the second cross-sectional area.

1 50. The assembly of claim 49 wherein the transport tube has a
2 bevel on an outer surface and the dilator tube has an inner surface with a
3 shoulder complementary to the bevel.

1 51. The assembly of claim 50 wherein the distal end of the transport
2 tube does not extend outside the dilator tube when the bevel abuts the
3 shoulder.

1 52. The assembly of claim 50 wherein the distal end of the transport
2 tube extends outside the dilator tube when the bevel abuts the shoulder.

1 53. The assembly of claim 47 wherein the transport tube includes an
2 outer wall with straight sides.

1 54. The assembly of claim 53 wherein the transport tube includes an
2 inner wall that converges to a needle opening that extends around the needle.

1 55. The assembly of claim 54 wherein the needle comprises a
2 hypotube.

1 56. The assembly of claim 54 wherein the transport tube and dilator
2 tube are respectively configured such that the distal end of the transport tube
3 is prevented from reaching the distal end opening of the dilator tube.

1 57. The assembly of claim 54 wherein the distal end opening of the
2 transport tube is smaller than the distal end opening of the dilator.

1 58. The assembly of claim 47 wherein the needle and transport tube
2 are formed from respective hypotubes.

1 59. The assembly of claim 58 wherein the transport tube is

2 approximately the same length as the dilator tube.

1 60. The assembly of claim 58 wherein the transport tube extends
2 past the distal end of the dilator.

1 61. A method of assembling a needle/dilator combination, the
2 method comprising the steps of:

3 positioning a dilator, having a proximal portion, a distal portion
4 and a distal opening, such that the proximal portion is accessible;

5 introducing a transport tube formed from a first material into the
6 proximal portion of the dilator;

7 passing a needle formed from a second material no harder than
8 the first material into the transport tube; and

9 advancing the needle within the transport tube until the needle
10 extends beyond the dilator distal opening.

1 62. The method of claim 61 wherein the step of introducing a
2 transport tube into the dilator occurs after the step of passing a needle into the
3 transport tube.

1 63. The method of claim 62 wherein the step of advancing the
2 needle occurs after the step of passing the needle into the transport tube.

1 64. The method of claim 61 further comprising the step of:
2 advancing the transport tube within the dilator until a distal
3 portion of the transport tube is adjacent to the distal portion of the dilator.

1 65. The method of claim 64 wherein the step of advancing the
2 needle occurs after the step of advancing the transport tube within the dilator.

1 66. The method of claim 61 further comprising the step of:
2 introducing the dilator into a sheath.

1 67. The method of claim 61 further comprising the step of:
2 passing the transport tube over a guidewire.

1 68. An assembly, comprising:
2 a dilator defining a distal portion;
3 a needle movable within the dilator and having a needle tip
4 formed from a material having a first material configuration; and
5 a surface layer between the dilator distal portion and the needle,
6 the surface layer having a second material configuration different than the first
7 material configuration.

1 69. The assembly of claim 68 wherein the first material configuration
2 is a first hardness and wherein the second material configuration is a second
3 hardness greater than the first hardness.

1 70. The assembly of claim 68 wherein the first material configuration
2 is a chemical composition and the second material configuration is a chemical
3 composition different than the chemical composition of the first material
4 configuration.

1 71. The assembly of claim 68 wherein the surface layer is integral
2 with the dilator distal portion.

1 72. The assembly of claim 68 wherein the surface layer is movable
2 relative to the dilator and to the needle.

1 73. The assembly of claim 72 wherein the surface layer includes a
2 tubular member.

1 74. The assembly of claim 72 wherein the dilator comprises a plastic
2 dilator, the surface layer is formed from a hypotube, and the needle is formed
3 from a hypotube.